

Commonwealth of Kentucky
Division for Air Quality
PERMIT STATEMENT OF BASIS

Draft Title V / Synthetic Minor, Construction / Operating

Permit: V-06-052 Revision 1

ISP Chemicals, LLC

Calvert City, KY 42029

April 21, 2008

Carolina Alonso, Reviewer

SOURCE ID: 21-157-00003

SOURCE A.I. #: 2939

ACTIVITY ID: APE20080001

SOURCE DESCRIPTION:

ISP Chemicals Inc. (ISP) is a large Synthetic Organic Chemical plant that makes a wide variety of intermediates and specialty chemicals. The source is a major source, as defined by 401 KAR 52:020 Title V Permits, for the potential emissions of over 100 tons per year of sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC), the potential of a single hazardous air pollutant (HAP) greater than 10 tons per year, and the potential combined HAP emissions greater than 25 tons per year.

The source is also a major source, as defined by 401 KAR 51:017 Prevention of Significant Deterioration of Air Quality (PSD), for potential emissions of over 100 tons per year of SO₂, NO_x, CO and VOC.

ISP applied on January 2, 2008 to incorporate requirements from 40 CFR 63 Subpart FFFF Miscellaneous Organic Chemical Manufacturing (MON) into permit V-06-052. Pursuant to 63.2445(b), the permittee shall comply with the requirements for existing sources not later than May 10, 2008. Under the provisions of 40 CFR 63.6(i)(9), the Division has granted a six-month compliance extension for the Group 1 process wastewater stream requirements of 40 CFR 63.2485. The facility must comply with the Group 1 process wastewater stream requirements of 40 CFR 63.2485 no later than November 10, 2008.

For the purpose of Title V permitting, this facility is split into the following areas:

1. **Gamma-butyrolactone (BLO) unit:** BLO is produced by vapor phase dehydrogenation of butanediol in a fixed-bed catalytic reactor. Crude BLO is distilled, purified, cooled, and stored. High boiling residues are removed as non-hazardous waste and shipped off-site for Btu recovery. Lights are sent to the comparable fuels tank for subsequent Btu recovery in ISP's boilers. By-product hydrogen is vented to the boilers for Btu recovery, or vented to the atmosphere. Wastewater is sent to the on-site wastewater treatment plant.
2. **Pyrrolidones unit:** 2-Pyrrolidone is produced by the reaction of anhydrous ammonia and BLO. The crude product is sent to a distillation unit, BLO is also reacted with an alkylamine to form a substituted pyrrolidone. Crude product is cooled and distilled in Area 315, or Area 211, or sent to a toll processor.
3. **Vinyl Pyrrolidone unit:** Vinyl Pyrrolidone (VP) is produced by reacting 2-pyrrolidone with

acetylene. Potassium hydroxide is used as a catalyst. Propane is used as an inert diluent. The crude VP is purified by distillation, and unreacted 2-pyrrolidone is recycled to the reactor. Some VP is stabilized and stored in tanks. The balance of the VP is used to make other products downstream of this process.

4. **Solvent recovery unit:** The distillates from the Gantrez ES-225 and ES-425 processes are separated into acetone and ethanol. Purge streams containing alcohols and ketones are combined and used in the boilers as comparable fuels. Ethanol is re-used in the Gantrez process.
5. **Methyl vinyl ether unit:** Acetylene is purified, mixed with methanol vapor, and fed to the reactor (vinylator). The catalytic reaction produces crude methyl vinyl ether (MVE), which is then purified, condensed, washed, and dried. MVE is reclaimed by removing the contaminant acetaldehyde. Since production of virgin MVE and MVE reclamation use some of the same equipment, the two processes cannot currently run simultaneously.
6. **Storage tanks**
7. **200 Building:** The 200 building is used to produce several products, each with many grades. Several grades of alkylated polyvinylpyrrolidone (Ganex) are produced by charging the reactor with VP, an olefin, an initiator, and alcohol as a diluent. After the reaction, the batch is cooled. When the desired solids content of the batch is achieved, the product is filtered, cooled, and packaged. Several grades of Polyvinylpyrrolidones (PVP) are produced by batch polymerization of n-Vinyl-2-Pyrrolidone (VP).
8. **236 Building:** Many different batch processes are conducted in the 236 building. The 236 building also uses some materials produced in the 240 building. Solution products are shipped out via tank trucks or drums. Dried products are packaged in drums or totes.
9. **240 Building:** Building 240 produces copolymers of maleic anhydride (MA), methyl vinyl ether (MVE), isobutylene, and isopropyl acetate. The reactions use various proportions of reactants, solvents, and initiators. Product slurry is generated in the four reactors, stripped of un-reacted monomer (if needed) in the stripping tanks, and then pumped to holding tanks that feed into the three product dryers. Dried powder is mixed in six blenders, and packaged into drums, totes, super sacks, or air pallets. Some reactor products are not dried, but are transferred to tanks for storage or transferred directly to downstream processes.
10. **315 Building:** In the 315 building copolymers of PVP are produced. VP and a solvent are charged to the reactor. The remaining amounts of VP and solvent are added followed by the initiator. When the monomer concentrations are below the specifications, the batch is cooled. The solids are adjusted after mixing with an additive. The product is then loaded into drums. Gafquats are produced when VP is copolymerized with various organic salts in presence of an initiator. Water or ethanol is typically used as a solvent. The solids are adjusted, filtered, and the final product is packed into drums. Batch products other than the above vinyl pyrrolidone-based products are also made in the 315 building. Solution products are shipped out via tank trucks and drums. Dried products are packaged in drums or totes.
11. **Higher vinyl ethers (HVE) unit (326 area):** A variety of high molecular weight vinyl ethers are produced in a batch process in the 326 Area. Raw materials are heated to reflux in a prep kettle.

Using the prep kettle vacuum, a solution of potassium hydroxide (KOH) is drawn into the kettle from the melt pot. The reaction occurs by sparging a mixture of acetylene / propane through the batch. Unreacted gas from the top of the reactor is released through a cooler to a buffer tank where acetylene / propane is added. Vapors from the gas in the cooler are separated and returned to the reactor. The batch is then transferred to the degasser, where residual acetylene / propane is removed by sparging with nitrogen. After sparging, the degasser is discharged either to the unit, a tank wagon, or to drums.

12. **334 Building:** PVP-I is prepared in the 334 building by reacting iodine prills with PVP powder. The reaction occurs at controlled conditions in a tumbler mixer to form an iodide complex in the presence of water. The slurry is then spray dried and packaged into drums.

13. Wastewater treatment

14. Utilities / R&D

The application includes an extension for the following project:

- Construction of new reactor and dryer in 240 Building. Since uncontrolled emissions are over 40 tpy for VOC, the facility has accepted operating limits to preclude applicability of PSD.

COMMENTS:

Applicable Regulations:

The source is subject to the following regulations:

401 KAR 50:012. *General Application* for Reasonable, Available, and Practical control technologies.

401 KAR 51:017. *Prevention of Significant Deterioration of Air Quality.*

401 KAR 59:010. *New Process Operations* constructed after July 2, 1975.

401 KAR 59:015. *New Indirect Heat Exchanger* constructed after April 9, 1972.

401 KAR 61:015. *Existing Indirect Heat Exchangers* constructed prior to April 9, 1972.

401 KAR 61:020. *Existing Process Operations* constructed prior to July 2, 1975.

401 KAR 63:010. *Fugitive Emissions.*

401 KAR 63:015. *Flares.*

40 CFR 60 Subpart Dc. *Standards of performance for small industrial-commercial-institutional steam generating units that commences construction, modification, or reconstruction after June 9, 1989.*

40 CFR 61 Subpart J. *National Emission Standard for Equipment Leaks (Fugitive Emission sources) of Benzene.*

40 CFR 61 Subpart V. *National Emission Standard for Equipment Leaks (Fugitive Emission Sources.)*

40 CFR 61 Subpart Y. *National Emission Standard for Benzene Emissions from Benzene Storage Vessels.*

40 CFR 61 Subpart FF. *National Emission Standard for Benzene Waste Operations.*

40 CFR 64. *Compliance Assurance Monitoring (CAM)*, applies to the Riley boiler and the 200 Gas Spray Dryer for particulate matter.

40 CFR 63 Subpart FFFF - *National Emission Standards For Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing* applies sourcewide.

40 CFR 63 Subpart EEEE - *National Emission Standards For Hazardous Air Pollutants: Organic Liquid Distribution (Non-Gasoline)* applies to some storage tanks and transfer racks.

40 CFR 63 Subpart GGGGG - *National Emission Standards For Hazardous Air Pollutants: Site Remediation*.

Non-Applicable Regulations:

40 CFR 63 Subpart DDDDD, *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters* was vacated and remanded by U.S. Court of Appeals on July 30, 2007. The facility will be required to perform a case-by-case MACT analysis, if notified to do so.

Emission Factors:

Emission factors are mainly calculated using the Emissions Master database (ISP's software). Boilers emissions are based on AP-42 factors.

EMISSION AND OPERATING CAPS DESCRIPTION:

In order to preclude applicability of 401 KAR 51:017, Prevention of Significant Deterioration of Air Quality (PSD), the source has elected to accept the following limits:

Area	Equipment	Limit Description	Pollutant
BLO	BLO process unit	The permittee shall calculate and maintain a record of actual process vent emissions, in tons per year on a calendar year basis, of VOC from the BLO process unit.	VOC
240 Building	Reactor 5 and Dryer 4	Emissions shall not exceed 36 ton/yr.	VOC
236 Building	Drum Dryer 236/3506	Actual emissions shall not exceed 36 ton/yr.	VOC
Zurn Boiler	Zurn Boiler	No. 2 Fuel Oil use shall not exceed 700,000 gal/yr.	SO ₂
Zurn Boiler	Zurn Boiler	Emissions shall not equal or exceed 36 ton/yr.	SO ₂

PERIODIC MONITORING:

PM/PM10 controls include a cyclone, baghouses, and scrubbers. Periodic monitoring consists of routine maintenance, monitoring of pressure drops, and periodic visual observations.

The source has a thermal oxidizer and regenerative thermal oxidizer to control emissions of HAPs in order to meet the requirements of 40 CFR 63 Subpart FFFF. Refer to permit V-06-052 Revision 1 for specific monitoring requirements.

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.